

IN THE CLAIMS:

The text of all pending claims, (including withdrawn claims) is set forth below. Cancelled and not entered claims are indicated with claim number and status only. The claims as listed below show added text with underlining and deleted text with ~~striketrough~~. The status of each claim is indicated with one of (original), (currently amended), (cancelled), (withdrawn), (new), (previously presented), or (not entered).

Please CANCEL claims 2 and 26, AMEND claims 1, 3-16, 19-25, and 27-47, and ADD new claim 48 in accordance with the following:

1. (Currently Amended) A machine component monitoring system ~~for~~ monitoring machine components used in a machine system, ~~provided with~~ a plurality of ~~such said~~ machine components each having rolling elements, ~~which said machine component monitoring system comprises~~comprising:

a control means~~unit~~;

a plurality of determining units, ~~each electrically connected, respectively,~~ with a plurality of sensors, said determining units being electrically connected with the control ~~means~~unit, each of the sensors being arranged on the respective machine component ~~for and~~ detecting an influence signal induced in the machine component and resulting from passage of the rolling elements ~~induced in the machine component~~, each of the determining units ~~being operable to determine~~determining, according to a predetermined process set-up condition, a status of the respective machine component, said status being at least one of such as presence of an abnormality, or absence of an abnormality, and lifetime and others of the respective machine component, which is associated with such sensor, in reference to an output signal from the ~~associated respective~~ sensor; and

said control ~~means~~unit ~~being operable to collect~~ collecting results of determination performed by each of the determining units,

wherein when determining the status, each determining unit determines one of a presence of an abnormality and an absence of an abnormality in a sensor waveform, which is the output signal from the associated sensor.

2. (Cancelled)

3. (Currently Amended) The machine component monitoring system as claimed in ~~Claim 2~~claim 1, wherein each of the determining units determines whether ~~or not~~ a defect signal component contained in the sensor waveform deviates from a predefined range₁ and, in the event that the defect signal has been determined as deviating from the predefined range, determines the presence of a defect waveform abnormality as the abnormality in the sensor waveform.

4. (Currently Amended) The machine component monitoring system as claimed in ~~Claim 2~~claim 1, wherein each of the determining units compares sensor waveform main signal cycles of the plural sensors connected therewith₁ and, in the event that the main signal cycle is not found within a predefined range, determines the presence of a rotation abnormality as the abnormality in the sensor waveform.

5. (Currently Amended) The machine component monitoring system as claimed in claim 1~~Claim 2~~, wherein each of the determining units ~~has a capability of detecting~~detects one of a presence or and an absence of a determiner abnormality, which is an abnormality resulting from the respective determining unit itself, and a sensor waveform abnormality resulting from the sensor waveform.

6. (Currently Amended) The machine component monitoring system as claimed in claim 1~~Claim 2~~, wherein the control ~~means-unit~~ makes a transmission request sequentially to the determining units₁ and each of the determining units ~~transmit~~transmits a result of determination to the control ~~means-unit~~ in response to the transmission request.

7. (Currently Amended) The machine component monitoring system as claimed in claim 1~~Claim 2~~, wherein the control ~~means-unit~~ ~~has a capability of commanding~~commands setting and changing of the process set-up condition for each of the determining units₁ and each of the determining units ~~is capable of changing~~changes the process set-up condition according to the command from the control ~~means-unit~~.

8. (Currently Amended) The machine component monitoring system as claimed in ~~claim 1~~Claim-2, wherein each of the determining units has a plurality of waveform processing ~~means for~~units processing the sensor waveform according to different waveform processing techniques, and ~~has a capability of selecting~~selects one of the waveform processing ~~means~~units that is to be used for processing the sensor waveform, and the control ~~means-unit~~has a capability of applyingapplies a selection command necessary to select one of the waveform processing ~~means-units~~units for the particular determining unit.

9. (Currently Amended) The machine component monitoring system as claimed in ~~claim 1~~Claim-2, wherein each of the determining units has a plurality of waveform processing ~~means for~~units processing the sensor waveform according to different waveform processing techniques, and ~~has a capability of selecting~~selects one of the waveform processing ~~means~~units for each of the sensors.

10. (Currently Amended) The machine component monitoring system as claimed in ~~Claim~~claim 1, wherein wiring used to connect the determining units and the associated sensors is ~~used in the form of~~ a sheathed sensor cable having a sheath ~~having a~~that is water proof, a dust proof, a-rust proof, ~~a~~and moisture proof, and ~~resistances to~~resists oil, heat, and electromagnetic noisesnoise.

11. (Currently Amended) The machine component monitoring system as claimed in ~~claim~~Claim-1, wherein each of the determining units has a relay terminal, and the determining units are sequentially wired together through the respective relay terminals.

12. (Currently Amended) The machine component monitoring system as claimed in claim Claim-1, wherein the machine system is ~~a~~an aggregation of a plurality of machine system constituent elements, each including the plural machine components, and wherein each of the determining units is used one for each of the machine system constituent elements and the sensor connected with each of the determining units is arranged on the machine component provided in one of the machine system constituent elements that is associated with such determining unit.

13. (Currently Amended) The machine component monitoring system as claimed in claim Claim-1, wherein the control ~~means-unit~~ has an automatic monitoring mode and a terminal operated mode, wherein in the automatic monitoring mode, ~~is a mode in which~~ a result of determination performed by each of the determining units is acquired by sequentially issuing a transmission request to request the respective determining unit to send the result of determination, and in the terminal operated mode, ~~is a mode in which by making when~~ a transmission request is made to request the respective determining unit to send the result of determination and information other than the result of determination, a response thereto is acquired.

14. (Currently Amended) The machine component monitoring system as claimed in claim Claim-1, wherein each of the determining units captures as digital data, the sensor waveform which is the output signal from each of the sensors connected therewith, and the control ~~means-unit~~ includes a waveform data storage ~~means-for-unit~~ storing the sensor waveform that is the digital data captured by each of the determining units.

15. (Currently Amended) The machine component monitoring system as claimed in claim Claim-1, further comprising a maintenance information generating ~~means-for-unit~~ generating predetermined maintenance information associated with the machine component, based on a result of determination performed by each of the determining units.

16. (Currently Amended) The machine component monitoring system as claimed in ~~claim~~ Claim 1, further comprising an information processing ~~means-unit~~ positioned at a location remote from the control ~~means-unit~~ and connected with the control ~~means-unit~~ through a communication network, and wherein the control ~~means-unit~~ ~~has a capability of collecting~~ collects not only a result of determination performed by each of the determining units, but also a sensor waveform inputted to each determining unit, said information processing ~~means-unit~~ including a remote data collecting ~~means-for-unit~~ collecting the result of determination and the sensor waveform ~~which-that~~ the control ~~means-unit~~ has collected from each of the determining units.

17. (Withdrawn) A combined sensor and determiner unit for use in a machine system including a plurality of machine components each having rolling elements, which unit comprises:

a plurality of sensors each arranged on the respective machine component for detecting an influence signal resulting from passage of the rolling element induced in the respective machine component; and

a plurality of determining units each including a filtering means for extracting a component of a defect signal from a sensor waveform that is an output signal from the sensor connected with such determining unit, and a determining section operable to compare the detected defect signal with a predefined range to determine presence or absence of an abnormality;

said filtering means extracting the defect signal component by repeatedly performing at predetermined interval a process of retrieving a predetermined time range data from a data stream of the sensor waveform and determining a difference between maximum and minimum values of the retrieved data.

18. (Withdrawn) A determining unit which comprises:

a selector for sequentially changing one of a plurality of input channels to which analog sensor waveform signals are inputted, an A/D converting means for performing an A/D conversion on an output from the selector;

a first memory for storing the waveform signal which has been A/D converted;

a processor for waveform processing the waveform signal, stored in the first memory, according to a process set-up condition and performing a predetermined determination from a result of waveform processing according to a predefined range;

a second memory for storing the result of the waveform processing and the result of determination process performed by the processor; and

an interface section for transmitting contents stored in the first and second memories in response to a request command applied thereto from an external circuit.

19. (Currently Amended) A machine component monitoring and diagnosing system ~~for~~ monitoring and diagnosing a machine component having rolling elements, which system comprises:

a sensor ~~for~~ detecting a factor associated with a lifetime of a machine component incorporated in a machine used at a business establishment of a client corporation;

a sensor information transmitting ~~means for~~ unit transmitting at least one of information detected by the sensor ~~or~~ and information processed with such detected information to a line;

a sensor information receiving ~~means~~ unit installed at a business establishment of a manufacturing and selling corporation, which manufactures and sells the machine component, ~~for~~ receiving the sensor information transmitted through the line;

a diagnosing ~~means for~~ unit diagnosing a state of the lifetime of the machine component in reference to the sensor information received by the sensor information receiving ~~means~~ unit;

a diagnosis result information transmitting ~~means for~~ unit transmitting diagnosis result information ~~given by~~ from the diagnosing ~~means~~ unit to the line; and

a diagnosis result information receiving ~~means~~ unit installed at the business establishment of the client corporation ~~for~~ receiving the diagnosis result information transmitted through the line,

wherein the diagnosing unit includes an examining section to automatically determine, when the sensor information is inputted, whether at least the machine component is properly usable, and a manual diagnosing section to at least one of add a result of diagnosis performed by a person to the result of diagnosis performed by the examining section, and modify the result of diagnosis performed by the examining section based on the result of diagnosis performed by the person.

20. (Currently Amended) A machine component monitoring and diagnosing system ~~for~~ monitoring and diagnosing a machine component having rolling elements, which system comprises:

a sensor information receiving ~~means-unit~~ installed at a business establishment of a manufacturing and selling corporation manufacturing and selling the machine component, ~~for~~ receiving through a line information detected by a sensor ~~for~~ detecting a factor associated with a lifetime of the machine component incorporated in a machine used by a client corporation located at a remote place;

a diagnosing ~~means-for~~unit diagnosing a state of the lifetime of the machine component in reference to the sensor information received by the sensor information receiving ~~means~~unit; and

a diagnosis result information transmitting ~~means-for~~unit transmitting information on a result of diagnosis by the diagnosing ~~means-unit~~ to the line,

wherein the diagnosing unit includes an examining section to automatically determine, when the sensor information is inputted, whether at least the machine component is properly usable, and a manual diagnosing section to at least one of add a result of diagnosis performed by a person to the result of diagnosis performed by the examining section, and modify the result of diagnosis performed by the examining section based on the result of diagnosis performed by the person.

21. (Currently Amended) The machine component monitoring and diagnosing system as claimed in ~~Claim-claim~~ 19, wherein the sensor information transmitting ~~means-unit~~ includes an information collecting section ~~for~~ collecting the information detected by each of sensors, the sensors being provided one for each of a plurality of machine components, and an information transmitting section ~~for~~ transmitting the information, collected by the information collecting section, to the line.

22. (Currently Amended) The machine component monitoring and diagnosing system as claimed in ~~Claim-claim~~ 19, wherein the diagnosis result information ~~brought by from~~ the diagnosing ~~means-unit~~ includes a result of determination of whether ~~or not~~ the machine component is properly usable, and a result of determination of an available term of use if the machine component has been determined properly usable ~~properly~~.

23. (Currently Amended) The machine component monitoring and diagnosing system as claimed in ~~Claim-claim~~ 19, wherein the sensor ~~is operable to detect~~ detects at least one of vibration waveform, temperature, and image.

24. (Currently Amended) The machine component monitoring and diagnosing system as claimed in ~~Claim-claim~~ 19, wherein the diagnosing ~~means-unit~~ utilizes ~~for diagnosis-a~~ database for diagnosis, in which specifications for each type of the machine components and examples of diagnosis are registered.

25. (Currently Amended) The machine component monitoring and diagnosing system as claimed in ~~Claim-claim~~ 19, wherein the diagnosing ~~means-unit~~ utilizes ~~for diagnosis-a~~ database for diagnosis, in which environments of use of the machine components are registered.

26. (Cancelled)

27. (Currently Amended) The machine component monitoring and diagnosing system as claimed in ~~Claim-claim~~ 19, wherein each of the sensor information transmitting ~~means-unit~~ and the sensor information receiving ~~means-unit~~ ~~is capable of performing~~ performs a bi-directional communication, and the sensor information transmitting ~~means-unit~~ transmits the sensor information in response to a request signal from the sensor information receiving ~~means-unit~~.

28. (Currently Amended) The machine component monitoring ~~an~~ and diagnosing system as claimed in ~~Claim~~ claim 19, wherein the sensor information transmitting ~~means~~ unit transmits the sensor information on a regular basis and transmits the sensor information ~~it~~ even when a predetermined abnormality signal is received.

29. (Currently Amended) The machine component monitoring and diagnosing system as claimed in ~~Claim~~ claim 19, wherein the machine in the business establishment of the client corporation ~~is a machine having~~ has a plurality of ~~shafts~~ shaft, and wherein the machine component to be detected by the sensor is a bearing supporting ~~each of the shafts~~ shaft, said sensor information transmitting ~~means~~ unit transmitting sensor information on ~~these plural bearings~~ the bearing to the line.

30. (Currently Amended) A machine component monitoring, diagnosing, and selling system, which comprises:

a sensor ~~for~~ detecting a factor associated with a lifetime of a machine component incorporated in a machine used at a business establishment of a client corporation;

a sensor information transmitting ~~means~~ for unit transmitting at least one of information detected by the sensor ~~or~~ and information processed with such detected information to a line;

a sensor information receiving ~~means~~ unit installed at a business establishment of a manufacturing and selling corporation, which manufactures and sells the machine component, ~~for~~ receiving the sensor information transmitted through the line;

a diagnosing ~~means~~ for unit diagnosing a state of the lifetime of the machine component in reference to the sensor information received by the sensor information receiving ~~means~~ unit;

a merchandise information adding ~~means~~ for unit generating merchandise information associated with the diagnosed machine component ~~to be diagnosed according in accordance with~~ diagnosis result information of the diagnosing ~~means~~ unit and ~~for~~ adding this merchandise information to the diagnosis result information;

a diagnosis result information transmitting ~~means~~ for unit transmitting to the line merchandise information added diagnosis result information, which is the diagnosis result information added with the merchandise information; and

a diagnosis result information receiving ~~means-unit~~ installed at the business establishment of the client corporation ~~for~~ and receiving the merchandise information added diagnosis result information transmitted through the line.

31. (Currently Amended) A machine component monitoring, diagnosing₁ and selling system ~~for~~ monitoring, diagnosing₁ and selling a machine component having rolling elements, which system comprises:

a sensor information receiving ~~means-unit~~ installed at a business establishment of a manufacturing and selling corporation, which manufactures and sells the machine component, ~~for~~ receiving through a line information detected by a sensor ~~for~~ detecting a factor associated with lifetime of a machine component incorporated in a machine used at a business establishment of a client corporation at a remote location;

a diagnosing ~~means-for-unit~~ diagnosing a state of the lifetime of the machine component in reference to the sensor information received by the sensor information receiving ~~means-unit~~;

a merchandise information adding ~~means-for-unit~~ generating merchandise information associated with the diagnosed machine component ~~to be diagnosed according in accordance with~~ diagnosis result information of the diagnosing ~~means-unit~~ and ~~for~~ adding this merchandise information to the diagnosis result information; and

a diagnosis result information transmitting ~~means-for-unit~~ transmitting to the line merchandise information added diagnosis result information₁ which is the diagnosis result information added with the merchandise information.

32. (Currently Amended) The machine component monitoring, diagnosing₁ and selling system as claimed in ~~Claim-claim~~ 30, wherein the merchandise information added by the merchandise information adding ~~means-unit~~ includes price information and delivery date information.

33. (Currently Amended) The machine component monitoring, diagnosing, and selling system as claimed in ~~Claim~~claim 30, wherein the merchandise information added by the merchandise information adding ~~means~~unit includes information asking about a will to order, wherein the diagnosis result information transmitting ~~means~~unit includes information asking about the will to order in the merchandise information added diagnosis result information, and wherein the diagnosis result information transmitting ~~means~~unit is capable of conducting a bi-directional communication and capable of receiving agreement information with respect to the information asking about the will to order contained in the merchandise information added diagnosis result information.

34. (Currently Amended) The machine component monitoring, diagnosing, and selling system as claimed in ~~Claim~~claim 33, further comprising an order processing ~~means~~for unit generating arrangement information of delivery of the machine component according to contents ordered in the agreement information that is received by the diagnosis result information transmitting ~~means~~unit.

35. (Currently Amended) The machine component monitoring, diagnosing, and selling system as claimed in ~~Claim~~claim 34, further comprising an electronic decision making ~~means~~for unit making a decision according to electronic information in ~~dependence~~on accordance with contents of the order contained in the agreement information received by the diagnosis result information transmitting ~~means~~unit.

36. (Currently Amended) The machine component monitoring, diagnosing, and selling system as claimed in ~~Claim~~claim 30, further comprising a diagnosis result utilizing production planning support ~~means~~unit utilizing the diagnosis result of the diagnosing ~~means~~unit in planning a production of the machine component.

37. (Currently Amended) The machine component monitoring, diagnosing, and selling system as claimed in ~~Claim-claim~~ claim 30, wherein the sensor information transmitting ~~means~~ unit includes an information collecting section ~~for~~-collecting the information detected by each of sensors, the sensors being provided one for each of a plurality of machine components, and an information transmitting section ~~for~~-transmitting the information, collected by the information collecting section, to the line.

38. (Currently Amended) The machine component monitoring, ~~and~~-diagnosing, and selling system as claimed in ~~Claim-claim~~ claim 30, wherein the diagnosis result information ~~brought~~ by~~from~~ the diagnosing ~~means-unit~~ includes a result of determination of whether ~~or not~~ the machine component is properly usable and a result of determination of an available term of use, if the machine component has been determined properly usable-~~properly~~.

39. (Currently Amended) The machine component monitoring, ~~and~~-diagnosing, and selling system as claimed in ~~Claim-claim~~ claim 30, wherein the sensor ~~is operable to detect~~detects at least one of vibration waveform, temperature, and image.

40. (Currently Amended) The machine component monitoring, ~~and~~-diagnosing, and selling system as claimed in ~~Claim-claim~~ claim 30, wherein the diagnosing ~~means-unit~~ utilizes for diagnosis a database in which specifications for each type of the machine components and examples of diagnosis are registered.

41. (Currently Amended) The machine component monitoring, ~~and~~-diagnosing, and selling system as claimed in ~~Claim-claim~~ claim 30, wherein the diagnosing ~~means-unit~~ utilizes for diagnosis a database in which environments of use of the machine components are registered.

42. (Currently Amended) The machine component monitoring, ~~and diagnosing, and~~ selling system as claimed in ~~Claim-claim~~ claim 30, wherein the diagnosing ~~means-unit~~ includes an examining section ~~for to automatically performing~~ determine, when the sensor information is ~~in~~ inputted, ~~determination of whether or not~~ at least the machine component is properly usable, and a ~~human-manual~~ diagnosing means ~~for section to at least one of adding add~~ a result of diagnosis performed by a ~~human-person to the result of diagnosis performed by the~~ examining section, and or modifying modify the result of diagnosis performed by the examining section based on the result of diagnosis performed by a ~~human~~ the person.

43. (Currently Amended) The machine component monitoring, ~~and diagnosing, and~~ selling system as claimed in ~~Claim-claim~~ claim 30, wherein each of the sensor information transmitting ~~means-unit~~ and the sensor information receiving ~~means-unit~~ is capable of performing a bi-directional communication, and the sensor information transmitting ~~means-unit~~ transmits the sensor information in response to a request signal from the sensor information receiving ~~means-unit~~.

44. (Currently Amended) The machine component monitoring, ~~an diagnosing, and~~ selling system as claimed in ~~Claim-claim~~ claim 30, wherein the sensor information transmitting ~~means unit~~ transmits the sensor information on a regular basis and transmits the sensor information ~~it~~ even when a predetermined abnormality signal is received.

45. (Currently Amended) The machine component monitoring, ~~and diagnosing, and~~ selling system as claimed in ~~Claim-claim~~ claim 30, wherein the machine in the business establishment of the client corporation ~~is a machine having~~ has a plurality of shafts ~~shaft~~, and wherein the machine component to be detected by the sensor is a bearing supporting ~~each of the~~ shaft ~~shaft~~, said sensor information transmitting ~~means-unit~~ transmitting sensor information on ~~these plural bearings~~ the bearing to the line.

46. (Currently Amended) A machine component monitoring and diagnosing method ~~for~~ monitoring and diagnosing a machine component having rolling elements through a computer network, which method comprises, at a business establishment of a corporation manufacturing and selling the machine component:

~~a process of~~ receiving through a line₁ information detected by a sensor ~~for~~ detecting a factor associated with a lifetime of ~~a the~~ machine component, incorporated in a machine used by a client corporation at a remote location;

~~a process of~~ diagnosing a status of lifetime of the machine component based on the received sensor information by using an examining section and a manual diagnosing section; and

~~a process of~~ transmitting diagnosis result information, obtained as a result of ~~diagnosis~~ the diagnosing, to the client corporation through the line; and

planning a production of the machine component using a diagnosis result utilizing production planning support unit utilizing the diagnosis result information.

47. (Currently Amended) A machine component monitoring and diagnosing method ~~for~~ monitoring, diagnosing₁ and selling a machine component having rolling elements, which method comprises, at a business establishment of a corporation manufacturing and selling the machine component:

~~a process of~~ receiving through a line₁ information detected by a sensor ~~for~~ detecting a factor associated with a lifetime of a machine component, incorporated in a machine used by a client corporation at a remote location, ~~at a business establishment of a corporation manufacturing and selling the machine component~~;

~~a process of~~ diagnosing a status of lifetime of the machine component based on the received sensor information by using an examining section and a manual diagnosing section; and

~~a process of~~ generating merchandise information associated with the diagnosed machine component ~~to be diagnosed in dependence on~~ accordance with diagnosis result information obtained as a result of the ~~diagnosis~~ diagnosing, and transmitting the diagnosis result information₁ together with the merchandise information to the client corporation₁ through the line; and

planning a production of the machine component using a diagnosis result utilizing production planning support unit utilizing the diagnosis result information.

48. (New) A system, comprising:
- a sensor sensing a factor associated with a lifetime of a machine component incorporated in a client's machine, said machine having rolling elements;
 - a sensor information transmitting unit transmitting sensed information to a manufacturer of the machine component;
 - a diagnosing unit using the sensed information to diagnose a state of the machine component and estimate a remaining life of the machine component, said diagnosing unit having an automated examining section and a manual diagnosing section;
 - a merchandise information adding unit generating and adding merchandise information associated with the diagnosed machine component in accordance with diagnosis result information of the diagnosing unit
 - a diagnosis result information transmitting unit transmitting the merchandise information and the diagnosis result information to the client; and
 - a diagnosis result utilizing production planning support unit utilizing the diagnosis result of the diagnosing unit to plan a production of the machine component.